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Phthisis Pulmonalis

considered as an
Infectious disease.

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tory. On deciding upon a subject suitable as an Inaugural Essay for the degree of Doctor of Medicine of the University of Glasgow, the writer has chosen that of Tuberculosis with special reference to Phthisis Pulmonalis, partly because it is presently occupying the attention of the Profession at large, and also because in his humble opinion, it is a disease, which should at once be regarded, as belonging to the Zymotic Group, and dealt with accordingly. A disease which represents one-seventh of the mortality of the country, is surely one, worthy of our most careful consideration.

I shall in the first place, consider the Pathology of Tuberculosis in detail; secondly its communication from the lower animals to man, and from man to man, and finally offer a few suggestions, which experience, research, and observation, have shown to be unfavourable to the propagation of this disease in question.

I. Pathology :-

The word Tuberculosis is derived from the characteristic post-mortem features of this disease, which consists in the formation of the so-called Tubercles, in the diseased organ or tissue.

But on looking at such a tissue or organ, more critically, and hereafter we refer more particularly to that form of this disease affecting the lungs, and which has received its name

of Phthisis Pulmonalis we find two varieties of
Tubercle. Tubercles - viz -

1. Grey or miliary.
2. Yellow or Crude.

The exact significance and relationship, if any, between these two, has given rise to much controversy, and it is only within recent times that we have come to anything like unanimity, or a distinct understanding, as to the exact pathological nature of these varieties of Tubercle. Before proceeding further, it may be well here to state the characters of such bodies.

Tubercle. According to Coats - (Manual of Pathology 1st Edition - p. 154) - a Tubercle is "a defined roundish body, presenting at its peripheral parts, numbers of round cells like leucocytes:-
nearer the centre, rather larger cells, like the formative cells of Granulation Tissue, and often called Epithelioid cells:
and in its more central parts, one or more gigantic cells, having numerous nuclei, the so-called Giant Cells."
Such is a description of a typical Grey or miliary Tubercle, greyish in colour, and pearly-looking, and in size, about that of a millet-seed. On a little reflection, we see that such a structure is almost identical with that of Inflammatory New-formation, excepting that in the former, there is an entire absence of Blood vessels, and like such new-formation, is exceedingly prone to undergo various degenerations. By far the most frequent being that of Cessation, to which doubtless, we must ascribe, as accounting for

such an issue, the absence of blood-vessels.
In addition to this, the most common and usual result, we have occasionally fatty and fibrous transformations occurring in the tubercles. But these must unquestionably be due to some peculiar constitutional bias.

various writers

Regarded in this light, we see that the yellow or crude tubercle is simply a later stage in the history of the former, accounted for by the fact that Cassous changes have taken place in its substance.

Virchow.

Against this view however, we must refer to the opinion held by Virchow, and his followers, who maintains that the term Phthisis Pulmonalis is only applicable to those cases, which have resulted from a Pneumonia, in which Cassous degeneration has been the most important factor.
But in considering this view of the case we must remember, that Cassous degeneration alone, is no evidence of Tuberculosis, as we have the same process occurring in Inflammatory and other new-formations.
Again, on examining a Phthisical lung, not only do we find Tubercles, and these in various stages of growth and degeneration, but also that Inflammation has been present, with a similar tendency to degeneration in its products, and I think it is impossible to arrive at any other conclusion, than to presume that the Tubercles are the cause of the Inflammation, and not the Inflammation the cause of the Tubercles.
That such Inflammatory action has been actually present, it is only necessary to allude to the Catarrhal products in the neighbourhood of the

morbid process.

Although a General, as well as a local Tuberculosis, may arise from a Caseous mass, the result of an imperfectly resolved inflammation, as for example by ulcerating through the Thoracic duct or Pulmonary Artery, yet in the majority of cases, such a starting point has no actual foundation in the history of the case, and I think it is right to assume, that in those cases, where such has been shown to exist, that it has only subserved the part of a general predisposition to the disease.

Cohnheim. Cohnheim in order to account for the phenomena of Inflammation as leading to Caseation and Tuberculosis, alleged that there was a vulnerability on the part of certain persons, to irritations, which leave little, or at least for less permanent impressions upon others.

of Tubercle. We come now to enquire into the cause of the pathological changes in the lungs and elsewhere, and we can only come to one conclusion, and that is, that they depend upon an irritant of some kind or another.

periments. It has been shown as the result of innumerable experiments upon the lower animals, as follows:-

(1) By breathing the air containing the dried sputa;

(2) By feeding them with tubercular matter.-

(3) By inoculation:-

that tubercular matter contains a virus which is capable of transmission to other living animals, and giving rise in them to the ordinary Tubercular manifestations.

We shall now consider the exact nature of this virus.

of virus- **Nature of the Virus:-**

Assuming for the present that Phthisis Pulmonalis is a communicable disease, and that it primarily depends upon a specific poison like Typhus, and the other fevers, we naturally ask ourselves, whether this poison or "materies morbi", can arise "de novo", or is it produced from a former case?

rn & Klebs- According to the researches of Villemin and Klebs, it is held to be specific, and that it can only be produced by self-propagation.

ebert- Klebert in 1848, promulgated the Corpuscular Theory, as he believed he had discovered in the Caseous masses, peculiar cellular bodies, to which he applied the term, Tubercle Corpuscle, which were considered by him to be specifically related to Phthisis.

nheim. Cohnheim held that Tubercle was specific.

In the year 1882, Robert Koch, demonstrated that the disease was due to a Bacillus, (Berliner Klin. Wochenschrift. Vol. XV.) the result being that a complete revolution took place in regard to the views held by various observers, as to the exact nature of Tuberculosis.

Koch. According to Koch, the Bacillus Tuberculosis (as it is termed) occurs in the form of minute threads or rods, scarcely one-half the diameter of a red blood Corpuscle in length, and in breadth about one fifth of their length, and readily undergoing Spore-formation.

They are seen often in large numbers at that point or points where the tubercular process is advancing, and may even occasionally be seen inside the Giant Cells.

In Koch's own words, as the result of his manifold researches, he concludes that "the presence of Bacilli in the Tubercular masses, constitutes not only a concomitant fact in the tubercular process, but that it is the cause; and that we should see in the Bacilli the cause of Tuberculosis — a cause which had hitherto only been suspected, and which presents itself to us, in the form of a Unstable parasite."

phorisms microbe is e of a cer- isease :-

According to Koch there are certain conditions upon the proof of which only it can be definitely stated, that a particular micro-organism is the cause of a certain disease, and these conditions are amply fulfilled in the present case.

These conditions are as follows :—

1. The micro-organism in question must have been found in the blood, lymph, or diseased tissues of the man or animal, which has died of the disease.
2. The micro-organism taken from this medium (blood, tissues &) artificially cultivated out of the animal's body, must be transferred from culture to cultures through successive generations, taking the precautions necessary to prevent the introduction of any other microbe into these cultures so as to obtain the specific microbe, pure from every kind of matter proceeding from the body of the animal whence it originally came.
3. The microbe thus purified by successive cultures, and re-introduced into the body of a healthy animal capable of taking the disease, ought to reproduce the disease in question in that animal with its characteristic symptoms and lesions.

4. Finally, it must be ascertained that the microbe in question has multiplied in the system of the animal thus inoculated, and that it exists in greater number than in the inoculating liquid.
(See Milzbrand-impfung. 1883.)

The tubercle bacillus retains its virulent properties outside the body for a considerable time, especially when its sputa are dried up into dust, but it has been found by independent observers, as Bowmes. Tyndall, Koch &c, that the free access of fresh air and sunlight conduced, eventually destroyed the bacilli, in other diseases as well as in the present case.

Cavitky. Cavitky has shown that Phthisical sputum, exposed at the ordinary room temperature, and generally under all common life conditions, retains its infectiousness not longer than 2½ months.

Ransome. Again, in the Proceedings of the Royal Society. Vol. XLIX. pp. 66-68, Dr. Ransome from experimental observation, concludes that fresh air, and light, and a dry sandy soil, have a distinct influence, in arresting the virulence of the tubercle bacillus. That darkness somewhat interferes with this disinfectant action, but that the mere exposure to light, in otherwise bad, sanitary conditions, does not destroy the virus.

ion of virus. As has been previously stated, the bacillus can be cultivated outside the body, growing at a temperature between 30° and 41° C.

These cultures may be grown upon Gelatine, Solid Blood serum, Agar-agar, Beef broth and Glycerol, &c &c. These nutrient media are sterilized, and kept at the temperature of the Blood. 34°-38° C, and in pure

10 to 14 days, the cultures appear upon the surface of the soil, as small scales, and in four to six weeks by very slow growth, they increase in size to about that of a poppy seed. As a result of the vital activity of these micro-organisms, an intensely active poison is produced which is the more direct agent in bringing about the morbid changes in living structures.

ucci. One of the strongest arguments in favour of the Bacillary origin of Phthisis, is due to Maffucci. Maffucci made pure blood cultures of the Tubercle Bacillus, sterilized them completely, so as to destroy the vitality of the Bacilli, and injected Guinea pigs with the sterilized products. All died in from 3 weeks to 4 months, of a febrile disorder, accompanied by Marasmus. At the Post-mortem, one could observe Cell atrophy, stasis of the circulation, and in a few cases simple catarrhal inflammation, but without the slightest evidence of the development of Tubercular lesions.

This experiment almost conclusively points to the fact that the virus or Bacillus is the cause of the disease, as here the Bacilli were killed, but not their chemical products, and yet no Tubercular lesions were formed.

(Medical Pathology of Tuberculosis - Crookes. 1891. pp. 50-51.)

It has also been found that the breath of Phthisical patients, produces the Bacilli upon sterilized blood serum.

As great wasting and emaciation follows the advent of Tuberculosis, it is worthy of note t

Fessier. Refer to the fact that Phosphates and Albuminous compounds are found in large quantities in the urine and sputa, and it has been observed by Fessier that the loss in body-weight, corresponds to the increase of Phosphates in the urine.

Quinquand. Quinquand (in the Comptes Rendus Vol. LXXII - p. 48?), points out that the Haemoglobin in the blood, falls from its normal, (13·16 %) to 4·8 % towards the close of the disease.

The Sputa of Phthisical cases, contain more Nitrogen, than that from any other lung disease.

Panoff. Dr Panoff, in the Med-Chi. acad. St Petersburg 1888 gives an analysis of healthy Pulmonary mucus compared with the Sputum of Phthisis Pulmonalis

		Healthy mucus.	Phthisical Sputum.
	Water.	95·55	94·31
Solid Organic constituents	Mucin	2·37	2·28
	Extractive matters	·80	2·01
	Albumin + Salts	·46	1·20
Ash or Solid Inorganic constituents.	Sodium Chloride, Phosphates - Potash &c.	·82	1·30
		100·00	100·00

of the is Bacillus. The Tubercle Bacillus has the following analysis according to Dr A. Hammerschlag;-

Matter Soluble in alcohol	24·0
Albumin.	36·9
Cellulose.	28·1
Ash.	8·0
	100·0

In this analysis the whole of the Nitrogen present after treatment with alcohol, is in the form of albumin, containing 16% N. (Monatshefte für Chemie - Vol X. p. 9.)

Habitat of the Virus:-

1. The virus has been found in all tubercular products, whether arising from local or generalized lesions - in all organs and tissues.
2. 3. in the saliva and sweat - (Griffiths - "Microorganisms" - Proc. Roy. Soc. Edin. Vol. XV. p. 44.)
4. in the blood - (Dr. Weichselbaum - Wiener Med. Blätter 1884)
5. 6. in the fæces and urine - (Dr. Babès - Centralblatt für d. Med. Wissench - 1883)
7. 8. in the sputum and breath - (Ransome - Proc. Roy. Soc. 1882)

The virus when inoculated always produces tuberculosis, and its infective power is not lessened by successive cultivations.

Diseases in which the Tubercle Bacilli are found:-

1. Acute Miliary Tuberculosis.
2. Phthisis Pulmonalis.
3. Scrofulous Tubercle of the Brain.
4. Tubercle of the Intestines.
5. Scrofulous disease of the lymphatic Glands.
6. Scrofulous Synovitis.
7. Bovine Tuberculosis.
8. Tuberculosis of Guinea Pigs - Monkeys - Rabbits -
9. and in cases where the disease has been produced by inoculation. (Coats)

As the virus must be constantly in the air, or breaths, owing to the drying-up of the Sputa, and conveyed about by the fine dust, it follows that like other communicable diseases, it only produces its injurious effects when it finds a suitable nidus in the body, either acquired or the result of hereditary influences, and that it

should be allowed to rest, and settle down in the spot at which it has arrived: this opinion being strengthened by the fact that it is at the Apex of the lung, in the great majority of cases, that the disease begins, which as we all know, is its least expensile portion of that organ - whilst in a healthy person, the bacilli are thrown off, or otherwise disposed of, unable to proceed upon their paths of destruction, such as we find to be the case, in the other Zymurtic disorders.

Assuming now, that the bacillus has obtained a fitting resting-place, the formation of Tubercles takes place, along with the Inflammatory action already referred to, and which may be accounted for, either by the action of the toxins, or from the Tubercles acting as an irritant. (Coats.) Sooner or later, Caseous Necrosis sets in, the tubercles soften and break down, the result being that ulcers and Cavities are formed, whilst a fresh crop of Tubercles is being produced at the periphery, destined to undergo similar changes, and in this way is caused the destruction of the lung-substance, so well-known in the Post-Mortem Examination of those who have fallen Victims to this disease.

Although in the Adult, Tuberculosis occurs primarily in the lungs, as Phthisis Pulmonalis, yet it may occur secondarily in other organs, and in this connection it may be well to state, that Phthisis Pulmonalis, is but very rarely associated with Acute Miliary Tuberculosis, in which the toxins is present in considerable quantity in the blood, as it would

appear that in the former case although the virus would require to enter the blood before reaching distant organs, producing a secondary local Tuberculosis, that the tissues in a state of ordinary vitality have the power of destroying small quantities of the virus.
On the other hand the disease may begin in the glands of the bowels, and this is the most frequent mode of onset in children, in whom milk is the staple dietary, and it is highly probable, that the cause may be looked for in the fact, that it has come from Tuberculous cows. The evidence pointing to this fact will be increased to when we consider the communication of this disease from the lower animals to man. We must also remember that almost all the cases recorded of General Tuberculosis are not even associated with Phthisis Pulmonalis. (Coats.)
Although many observers regard Phthisis Pulmonalis as a local Tuberculosis, I am of opinion, that in a few cases this may be so, (still with our present methods of clinical examination, and research, we are unable to say, how far it may proceed without becoming general) that it is like diphtheria, essentially a constitutional disease, with a local manifestation, and although it may spread secondarily to other tissues and organs, yet the treatment up to a certain point is identical in both, having in view, the upbuilding of the constitution, and preservation of the Stamina.
We shall now proceed to classify the various forms of Tubercular disease.

Varieties of Tubercular disease.

1. **Acute Tuberculosis**
   or Acute Tubercular Fever.
   General Tuberculosis.
2. **Chronic Phthisis.**
   With predominating pulmonary complication -
   Phthisis Pulmonalis.
   With predominating affection of the Voice.
   Phthisis Laryngea.
   With predominating diarrhœa.
   Phthisis Enterica.
   Tubercular Diarrhœa.
   With Tumour of abdomen.
   Tabes Mesenterica.
   Tubercular Peritonitis.
   With Enlargement of liver.
   (Fatty and waxy liver.)
3. **Tubercular disease of the Brain.**
   including Hydrocephalus acutus.
   or Tubercular Meningitis.
4. **Anomalous or Masked Tubercular disease.**
   Pneumonic Phthisis. (Addison)
   Puerperal Phthisis.
   Phthisis with Empyema, or Abscess.
   Phthisis with Caries or Necrosis.
   Scrofula Tubercular disease.
   Fibroid Phthisis.

(From my MS. notes of Dr. Gairdner's Lectures on Phthisis Pulmonalis.)

Symptoms of the Various Forms of Tubercular Disease:-

Although I am not going to enter into the Clinical aspect of this question, still I consider it appropriate for my present purpose to refer to the Symptomatology of the disease, as from the following description and short history, we could apply it with equal force to any one of the different forms of Tubercular manifestation as detailed in the preceding table.

"After a period of failing strength and diminished activity of some of the bodily functions, a gradual loss of weight and flesh is observed. This symptom may at first be intermittent, but when the disease is established, it becomes progressive, notwithstanding hygienic precautions and the absence of any known determining cause. Febricula supervenes or attends from the first, and ultimately becomes habitual - (this is the Hectic fever) - with frequent remissions and exacerbations, and with greatly diminished power of resisting extremes of temperature. The hands and feet become habitually too hot, and too cold, by turns, and the general surface, especially the face is observed to be pale, flushed, or sweating especially at night, from a slight cause, or without any appreciable cause of excitement or depression. The internal temperature is either persistently or habitually over 100° F. Shiverings and sweatings occur, the latter succeeded by coldness of the surface, oftenest in the night time, or from the daytime, then mostly when the body is at rest. Sleep is often disturbed, and is not followed by a sensa-

tion of full refreshment. Languor and debility make insidious progress. emaciation advances. the sweats become more frequent and exhausting, or are replaced by other evacuation, and complications indicative of organic disease, with gradual destruction of one or more of the viscera occur."

(From my MS. notes of Dr. Gairdner's lectures upon Phthisis Pulmonalis.)

Prevalence of Tubercular disease:-

In its various forms, it attacks all ages, and all classes. But it must be borne in mind, that in dealing with the statistical aspect of the question, the returns of the Registrar-General, are not to be depended upon as giving the true rate of mortality, as in many cases which I have come across, the cause of death is often ascribed to some complication, or supervention of another secondary disease, from which but for the existence of the primary affection, the patient would in all probability have recovered: and also from the desire on the part of many to conceal the real cause of death from the relatives, who in general, have the greatest antipathy for this disease.

From the records of Post-mortem examinations at various Children's Hospitals, in different parts of the country, it has been found, that one-third of the total deaths under 10 years of age are due to Tubercular diseases.

The disease in children is more apt to affect the lymphatic glands and bones, the bacilli entering by the alimentary canal, passing along the lymphatics to the glands, and thence by the blood to the bones.

Prevalence of Tubercular lesions in Post-mortems at Edinburgh Royal Infirmary:-

Advancing lesions - 2%
Retrograde 8·4%
Absolute in less than - 1%

Total lesions assumed to be tubercular, under 50% say from one-third to one-half.

(Gairdner.)

Relation of Tubercle to the different organs:-

lungs - most frequent.
Trachea $\frac{1}{3}$.
Larynx $\frac{1}{5}$.
Epiglottis $\frac{1}{5}$.
Small Intestine $\frac{5}{6}$
Large Intestine $\frac{5}{6}$ (about)
Spleen $\frac{1}{6}$
Kidney.
Mesenteric glands.
Lymphatic glands.
less frequently in the Bronchial Glands.

(Louis.)

Table showing the average mortality and death-rates in Scotland for the Septennial 1882–1888.

(See Hyde- San. Jour. Jan. 1892.)

	All Causes.	Zymotic.	Tubercular.
	Rate per 10,000.	Rate per 100 deaths.	Rate per 100 deaths.
Scotland.	192·85.	13·16.	14·48.
Selkirk.	159	13·13.	18·36.
Orkney.	144·54.	5·74.	11·78.
Shetland.	164·41.	6·11.	12·91.
Caithness.	165·14.	8·21.	11·
Peebles.	141·43.	9·54.	13·23.
Berwick.	151·	9·54.	11·11.
Ross & Cromarty.	153·54.	10·51.	9·88.
Inverness.	166·42.	9·54.	9·44.
Kincardine.	150·43.	10·46.	11·24.
Sutherland.	158·41.	4·5.	12·11.
Argyle.	168·86.	4·64.	12·54.
Elgin.	140·42.	9·54.	12·94.
Kinross.	140·	6·31.	10·2.
Banff.	164·14.	11·36.	11·26.
Clackmannan.	146·	13·48.	15·84.
Haddington.	158·28.	9·4.	12·06.
Roxburgh.	144·54.	10·84.	13·41.
Wigton.	148·41.	8·1.	15·14.
Fife.	143·41.	4·8.	12·46.
Nairn.	165·14.	12·44.	9·51.
Kirkcudbright	145·41.	16·14.	16·51.
Aberdeen.	166·86.	10·04.	12·34.
Kirkintilloch.	189·43.	8·46.	13·3.
Dumfries.	190·85.	13·33.	14·44.
Perth.	143·3.	10·43.	12·23.
Stirling.	149·86.	14·66.	14·11.

	All Causes. Rate per 10000.	Zymotic. Rate per 100 deaths.	Tubercular. Rate per 100 deaths.
Bute.	203·85.	10·43.	15·64
Dumbarton.	149·3.	14·66	14·94
Ayr.	190·54.	13·1	16·23
Forfar.	193·43.	12·01	14·64
Edinburgh.	192·54.	13·31	14·63.
Renfrew.	214·43	16·4	15·44.
Lanark.	224·14	16·84	16·01.

It will thus be seen that from the above table, Tubercular diseases, almost invariably, cause more deaths than those ascribed to the whole of the Zymotic Group, amounting in round numbers to 14% of the total deaths. In the city of Glasgow, for the year 1888, 1089 deaths were due to the various Infectious diseases, and 1824 resulted from Tuberculosis: in other words 15·5% of the total mortality was due to Tubercular lesions.

Septennials

It may serve a good purpose at this stage of the question, to compare in a few words the state of affairs in the first Septennial 1855-61 with those given above, as it shows us the good results accruing from efficient Sanitation, and the adoption of those measures which have for their ultimate end, the diminished number of deaths from preventible causes; although the difference between the two as regards Tubercular disease, is scarcely worth considering, and almost conclusively pointing to the fact that we have not yet struck deep enough, nor adopted all those means for the purpose of checking the disease, as has been manifested in the case of the Zymotic disorders.

Deaths.	1855-61.	1882-88
All Causes - per 10,000.	207.28.	192.85.
Zymotic - per 100 deaths.	21.28.	13.16.
Tubercular - " " "	16.14.	14.48.

The above figures, show in the first place that there is a difference in favour of the latter, in the case of the deaths from all causes of 14.43 per 10,000 of the population, which represents a saving of 38,924 lives in 7 years, or 5561 per annum. From the Zymotic Group of 8.11 %, but only a difference of 1.66% in the case of tubercular diseases, insignificant enough, considering that there is a difference of over 20 years, in the two tables, during which little has been done in real earnest to grapple with this scourge of humanity.

II. Communication of Tuberculosis from the lower animals to man, and from man to man:-

That Tuberculosis is a disease affecting the lower animals, is I think, in the present day, an indisputable fact.

Bovine tuberculosis man.

As regards the identity of Bovine with Human Tuberculosis, a few salient points may be here referred to. M. Chauveau has demonstrated this identity by a number of experiments, that human tuberculosis could be imparted to other animals, and that the same condition was produced, as in other experiments, where Bovine Tuberculosis was inoculated. These results were attained in various ways, such as by the ingestion of food, by Venous, and subcutaneous injection.

Again, Professor McFadyean, has proved by direct observation and experiment, that the Tubercle Bacilli come from the milk-glands of affected cows, and consequently we need not be at a loss in accounting for so many wasting, and anomalous tubercular diseases occurring amongst young children and infants, in the absence of any hereditary or other known cause.

It does not follow that although the injection may enter by the intestine that these parts are first affected. On the other hand, the lungs are more often the first seat of the disease, and in this connection, it may be mentioned that it appears first in the lungs, when inoculated upon the lower animals.

Although Tubercle may exist visibly, only in the lungs and lymphatic glands, surely no one

can gainsay the theory deducible therefrom, viz - that the Bacilli may be, and are actually in point of fact, passing through and along with the blood, to remoter tissues, when they have been discovered in the bone-marrow.

This provides us with a strong argument in favour of the total condemnation of the carcasses of all animals affected with Tuberculosis.

According to arising 1 in 6 carcasses of beef are tuberculous, and about 1·5% of the latter are generally condemned.

According to the Report of the Departmental Committee of the Privy Council, it was held that "the disease may affect the flesh, and that the ordinary methods of cooking are often insufficient to destroy the Bacilli buried in the interior of the limbs", and that "although the Bacilli may be found but rarely in the flesh, still the chance of their being present either there or in the blood, is too probable to ever allow the flesh of a tubercular animal being used for food under any circumstances, either for man or the lower animals." From such a Report, only one conclusion can be drawn, and it is that, which it shall be my endeavour to show, that Tuberculosis is communicable from the lower animals to man.

At the International Congress on Tuberculosis held in Paris a few years ago, which consisted of between 300 and 400 members, all but three were of the unanimous opinion, and a motion to the effect was accordingly carried, that in view of the fact of the identity of the bacilli in Human and Bovine Tuberculosis and the possibility, nay, the high probability of the

disease being communicated through tainted meat and milk, that the total destruction was absolutely necessary of the flesh of all tubercular animals, no matter to what extent, the specific lesions in these animals existed.

Canada. On the 28th July 1888, the French Government included Tuberculosis in the list of Contagious diseases, and enforced the following regulations in regard to the flesh of Tuberculous animals.

Such flesh shall be excluded from Consumption:-

(a) If the lesions are generalized, that is to say, not confined exclusively to the Visceral organs, and their lymphatic glands.

(b) If the lesions although localized, have invaded the greater part of an organ, or are manifested by an irruption in the walls of the Chest, or in the abdominal cavity.

Con. As showing that the disease can be produced upon man, by inoculation, we know that Tubercles are produced by scratches and cuts upon the hands of those engaged in handling affected animals, and in these Tubercles thus produced, has been detected the characteristic bacillus.

As illustrating the subtle nature, and penetrating character of the Virus, we are all aware of the fact that it has been detected in bone-marrow, before any Visceral or other Visible affection has been produced.

From these observations, the conclusion, one must necessarily arrive at is this, that given a carcass, in which the Tubercle Bacillus is present, such carcass ought to be condemned as unfit for Consumption, so as to avoid any risk to the public health, and

this consideration, should always override that of Economic consideration.

Although the disease may at first be apparently local, it does not necessarily follow, that at the same time, it is not constitutional, as the virus must of necessity find a suitable resting-place, before it can thrive and propagate.

Although the absolute proof of Tuberculosis being produced by the ingestion of affected meat and milk is at the present time impossible, owing to obvious reasons, still little doubt can exist upon that point, when we see how easily it is communicated from animal to animal, and also owing to the rapid course, which some cases of Acute Tuberculosis assume in children, in which at the Post-mortem all the organs are seen to be affected with the disease, and in which heredity, and other known predisposing causes are conspicuous by their absence.

General Tuberculosis is produced in animals by inoculation, whether the bacillus be taken from a gland in Scrofula, or the lung in General Tuberculosis.

Bang of Copenhagen has reported the case of a child, six months old, affected with Tabes Mesenterica, which was fed with milk from a cow, which was suffering from, and afterwards succumbed to Tubercular Udders.

There is also on record, the case of a woman who died from Acute Tuberculosis, caused by having partaken of a fowl, improperly cooked, and which had suffered from Tuberculosis.

These two cases, will suffice, in the meantime, to show the truth of our enquiry.

Klebs. According to the investigations of Villemin and Klebs, it has been demonstrated that "Tuberculous matter derived from man will produce Pulmonary Phthisis in Animals, and this inoculated Phthisis may be transmitted by inoculation to other animals". With reference to transmission by inoculation in man, it is reported that Bennet, Paraskeva, and Gallonis, inoculated with the sputa of a tubercular patient, a person dying from progressive gangrene of the leg, and who was apparently free from Tubercles. Death ensued in thirty-eight days, and at the Post-mortem recent tubercles were found in the lungs. (Propagation of Tuberculosis - Hyatt, Fleming, and Van Hertsen pp. 90-91.)

culosis In the same treatise from which the above extract is ien. taken, another case of Miliary Tuberculosis of the lungs is reported in a boy, who was in the habit of drinking the milk from a cow which had to be destroyed, as it was suffering, according to the testimony of the Veterinary Surgeon, from Pulmonary Phthisis. ion by Many cases are recorded of the disease having been ng. transmitted through wearing the clothing of deceased victims. One example will suffice for our purpose:-

(1) The contagious power of Pulmonary Phthisis which has been several times observed has been lately confirmed in a very evident manner. A young farmer, in perfect health, received a present of shirts and clothes which had been worn by a person who died of Phthisis. He wore these articles, and in six months was dead from Phthisis. (Hufeland's Journal - Vol. VII Chap 1. pp. 34-35)

(2) Ritzen tells of a servant who inherited the clothes of his master who had succumbed to Phthisis; four weeks later symptoms of Phthisis appeared, and he

died in six months.

As instances of this transmission between married people let us quote the following, from the same source.

(1) A young woman in very good health, one of a family without any history of Phthisis was married to a Phthisical man, in whose family there had been several deaths from Tuberculosis. Some years after marriage the woman became ill and died of Phthisis. The husband who was fifty-two years of age again married. His second wife who was in perfect health at the time of marriage, subsequently died of Phthisis.

(2) Cullen mentions the following striking case:-
A young man predisposed to Phthisis, married a young Dutch woman of a sanguine temperament, and good constitution. Some days after their marriage, the woman lost her fresh colour and was affected with a bad cough; a month later she discharged bloody sputa. The doctor advised her not to sleep any longer in the same bed with her husband, but she would not take this advice; in six months she died of Phthisis. The nurse who waited upon her, and the domestic, who as a measure of prudence, was seldom in the bedroom, succumbed to the same disease.

Beckman. In 1480 Dr. Beckman, court physician at Hanover, gives the views of many physicians as to the nature and contagious character of Phthisis, and also gives cases of this transmission between married people.

Another argument in favour of the identity of Human and Bovine Tuberculosis, is to be found in the analogies existing between these two diseases in regard to Contagion and Hereditty.

Let us now glance at the various data, which go to prove that these diseases are identical.

Evidence in favour of the Identity of Bovine and Human Tuberculosis:—

1. Tuberculosis has been observed in all warm-blooded animals, submitted to domesticity or deprived of their liberty.
2. Tuberculosis in animals and mankind presents analogous manifestations in the living as in the dead creature.
3. The course and termination of the disease in mankind and animals is the same.
4. The masses of Tubercle, and especially the sputa of the Phthisical, produce Tuberculosis in animals, when these matters are introduced through the respiratory or digestive apparatus, or through a deep wound. Tuberculosis inoculated from man to animals, may in its turn be transmitted from one animal to another, and always produces Tuberculosis.
5. Tuberculosis of man and animals is transmitted by heredity.
6. The disease is contagious in man and animals.
7. There are clinical observations which prove the transmission of Tuberculosis from animals to man by the consumption of the milk of Phthisical animals.
8. Tuberculosis of animals and man is rare in cold climates, where it does not even appear to be developed. It is most frequent in Southern countries; the tracings of the geographical propagation of the disease in man and animals are nearly parallel.
9. It is evidently proved that a pathogenic microbe having the same morphological and biological characters exists in the tubercle of man, and animals, and cultivations of it produce the disease in other animals.

(Propagation of Tuberculosis p. 94.)

Mode of Entrance of the Tubercle Bacilli-

1. As has been previously indicated, the bacilli may enter the system of man and animals by the inhaled air-
a. or dust containing the dried sputa-
b. or by a spray containing the sputum.
c. It is especially communicated from one animal to another, under precisely the same insanitary conditions, as are met with in man; such as overcrowding, filthy surroundings, and bad ventilation, where healthy beasts inspire the air of those diseased, as we have already shown that the Bacillus has been detected in the breath.
2. Again, Ingestion is a fertile source of the disease. as this has been proved by feeding animals with Tubercular Tissues, Sputa, Saliva, milk, and Tubercle Cultures, as well as from the pearl-nodules of Bovine Tuberculosis, and flesh of the same.
Next to man, the relative frequency of the disease in the lower animals is shown below:-

1. Cows.
2. Fowls.
3. Rodents.
4. Pigs.
5. Goats.
6. Sheep.
7. Horses.
8. Carnivora.

Transmission of the disease by forage and water, has also been shown to occur.
3. By Inoculation the disease may invade the system, both in man and animals, by scratches and sores, coming in contact with Tubercular sores and secretions.

in man. The disease in man has been communicated by
a. sleeping with those suffering from the disease -
b. from wearing the clothes of Phthisical persons -
c. by mothers. suffering from Tuberculosis, chewing the food for their infants.

Reich. Reich records ten cases of tubercular meningitis in fifteen months, in his practice of a Phthisical midwife, who was in the habit of sucking the mucus from the mouths of newborn infants, and of blowing air into their lungs. It has also been previously shown that cases have been caused through the flesh and milk of affected animals.

Gaetier. M. Gaetier, has lately stated that he has found the Bacilli in whey and Cheese from the milk of Tubercular cows, and that pigs and fowls fed upon such, developed the disease. The possibility of this transmission to man in this way, must not be overlooked.

edity. 4. We come now to consider the very interesting question of Heredity, as regards the transmission of Phthisis Pulmonalis.

Before proceeding further, I cannot do better than give a few extracts from M. Thompsons classical treatise upon Family Phthisis.

upon. In that volume, he proceeds to shew the influence of Heredity in a very able manner, by a series of propositions, which are as follows: —

I. Individuals who give a history of Family Phthisis, are more liable to Phthisis than the Community at large.

This is shown by giving the deaths from Phthisis, amongst the policy-holders of several insurance

companies.

of 400 consumptives, 62 or 15·2% had lost a parent, brother, or sister from Phthisis.

of 400 non-consumptives (or who had died from other diseases) only 44 or 10·8% had such a history.

of 1031 Consumptives in another company - 18·81% had such a history.

of 1031 Non-consumptives - only 9·89% had such a history.

In 1000 deaths in another company, 38% of those who died from Phthisis, had the history of the disease in the family; whilst the proportion of deaths, from the same disease, amongst the policy-holders in general, was only 26·8%.

II. Consumptives who give a history of parental Phthisis, are disposed to be attacked by the disease at an earlier period of life, than those who have no such history.

In the following table, the comparative number for the several quinquennial periods of life attacked by the disease is shown, between 2000 Hereditary and 2000 acquired cases: the result being that the hereditary cases are liable to the onset of the disease in much greater numbers, than the acquired cases, before twenty five years of age: that between twenty-five and thirty, the numbers are identical, but that the acquired cases are more abundant after thirty.

The 2000 cases in each class, include 1000 males and 1000 females.

The proportion of the liability for the hereditary cases, is as 11 to 4·8 - before twenty-five years

of age, which is more than double that for the later period.

Table showing the date of attack in 2,000 cases of Hereditary Phthisis, and 2,000 cases of acquired Phthisis

Ages.	1	10	15	20	25	30	35	40	45	50	55	60	Total
Hereditary	26	120	436	549	392	214	149	65	24	6	9	4	2000
Acquired.	14	79	319	456	392	284	221	124	63	30	11	1	2000

Such a table shows that Hereditary influence, exhibits itself earlier in life than in cases due to other and acquired causes.

III. Consumptives who give a history of Phthisis in both parents are disposed to be attacked at an earlier period of life, than those who have a history of simple Heredity only. This is shown by the relative numbers for males under the influence of direct, Cross and Double Heredity, when added together, between fifteen and twenty-five years of age, giving the comparative liabilities as proportionate to the following numbers per 1000.

The same result is obtained in the case of females between 10 and 20 years of age.

Heredity -	Males - (15-25 yrs)	Female (10-20 yrs)
Direct.	384.	244
Cross.	486.	270
Double.	555.	290.

Heredity - continued:-

From the earliest times, it would appear that the belief in the hereditary nature of Tuberculosis, was held by many independent observers.

According to Baumgarten, the most important factor is hereditary transmission, that is, the transmission of the virus itself, and not of a tissue predisposition during intra-uterine life through the Placental circulation from the mother, and remaining latent till some exciting cause calls it into activity.

He holds that there is no such thing as a tubercular diathesis or predisposition; but on the other hand, such observers as Ollt, Ziegler, Birch-Hirschfield, are of the distinct opinion that there is a hereditary predisposition, a diathesis.

According to Cornet, not much stress is laid upon predisposition as affecting its Etiology.

Baumgartens theory of the transmission of a virus is strengthened by the fact, that he has found the bacilli in the ovum, whilst others have seen them in the Spermatozoa.

Professor Johne has found them in the lungs of a 4th month intrauterine calf.

They have also been discovered by Jani and Wiegert in the Vesicular seminales, and seminal tubes of the testes of Tubercular men, and in the Vagina and Fallopian tubes of Phthisical women.

That Heredity plays an important part in the propagation of Tuberculosis in the lower animals, is evident from the Report upon Tuberculosis, published by Hujdtin, Fleming, and Van Herton already referred to - may be seen from the following:-

Influence of Heredity in Animals :-

1. That Heredity is not without influence on the propagation of Tuberculosis.
2. That this disease is transmitted by the male as well as by the female parent.
3. That the transmission of the morbific principle to the foetus, or foetus, in process of development, is a cause of sterility in parents, and frequently occasions abortions or premature births.
4. That a foetus infected with Tuberculosis only rarely attains complete maturity, and only infrequently is born in a state of normal vitality.
5. That notwithstanding these facts, the possible birth (perhaps even a great number of births) of tuberculous descendants, which may develop and multiply the same as those derived from perfectly healthy ancestors, and without any predisposition, cannot be denied.
6. That Tuberculous parents may transmit to their progeny a predisposition to Tuberculosis.

As regards the question of Heredity in Tuberculosis from experimental observation, Rigal has obtained negative results by inoculating Guinea Pigs with fragments of organs, removed from still-born children or foetuses, derived from Tubercular mothers, and from fragments of Placenta. Later on, he again inoculated them with the Tubercle bacillus in the Peritoneum; he then used the liver and spleen from their offspring to inoculate other Guinea Pigs, but again with negative results.

From these observations he came to the conclusion that the transmission of Tuberculosis from mother to foetus during pregnancy occurred only in excep-

-vely rare cases.
M. Hutinel appraised that Congenital Tuberculosis was very rare.
Still, from what has been said previously about the transmission of the disease, both in animals and man, we cannot, however much we should care to do so, close, than believe, that Heredity, whether by the transmission of the Tubercle Bacillus, or a Tubercular Diathesis, calling into play the activity of the Bacillus, when a favourable opportunity presents itself, that Heredity, as we at present understand it, has much to do with the propagation of this disease.
In regard to Baumgartens theory that the Virus is transmitted, it is worthy to note in support of this view, that there has lately been recorded, the first instance in the human race, of the direct transmission of the Tubercle Bacillus from Mother to Foetus, by Birch-Hirschfield and Schmorl, in Ziegler's Beiträge zur path., anat. und, allg., Path. 1891- p. 429.
As regards cases occurring in families, by Contagion or Infection, we must remember that this alone cannot account for many such, as we have all met with generations of families, in which several of the children, have succumbed to various forms of Tubercular disease, after long intervals from the immediately preceding case.
And we must also be aware lest we should ascribe cases as pointing to Hereditary influences when in reality they have been due to Contagion or Infection.

A few examples will suffice:-
Heinie, a tubercular patient, aged 22 years, who had inherited Phthisis, was an intimate friend of Charlotte aged 24 years, who was entwined with the disease, either hereditary or acquired, and at the same time, had never had any of the phthisiogenic diseases. Charlotte slept with Heinie for months at a time, and over a number of years without becoming Tubercular. However Charlotte at the above age, contracted a severe cold, which unfortunately was neglected, and thereby her constitution becoming of a lower standard than usual, offered a fertile soil, for the growth and development of Bacillus Tuberculosis. By breathing an infected atmosphere Charlotte became distinctly tubercular and died of Pulmonary Phthisis at the age of 26 years. Heinie who has since taken a sea-voyage, is now better- the phthisical complaint being entirely cured.
The above is an authentic case of direct infection, for there was no hereditary predisposition, or Phthisis in a latent form- Charlotte's mother being still alive. but her father died of Angina Pectoris at the age of sixty-two years.
Jean, a tubercular patient was married to Antoinette, a young woman with no previous tendency to Tuberculosis. Jean died, and his wife became Phthisical. She was remarried to Louis, who had likewise, no Phthisical taint. Louis and Antoinette both died of Phthisis.
The niece of the latter speedily without Phthisical taint contracted the disease in nursing her aunt, then married, and her husband, was in his turn, attacked by Phthisis. All these people resided in a place in which

it was easy to verify the absence of hereditary taint. A young woman, without hereditary taint, nursed a phthisical patient and contracted phthisis. She returned home, and communicated the disease to the old sisters with whom she lived. One sister survived, but she was not living with her family. A soldier became phthisical while with his regiment and was therefore discharged, and returned to his family. His father, mother, two brothers, and a neighbour who nursed them became phthisical. Yet none of them were predisposed by hereditary taint.

From these facts, it will be perceived, how easy it is to pronounce such and such a case as hereditary when it is one of undoubted infection.

(Griffith's Microorganisms. pp. 292-293)

On the other hand, endemic causes may be the true origin of the disease, which likewise may be overlooked in favour of the hereditary influence. It has already been mentioned that a predisposing cause to the incidence of the disease, is a lowered state of vitality, which may be induced in various ways, and this we often know in the clinical history of tubercular disease of bones and joints, in which the parts have received, it may be at some remote period, an injury, which at the time, has been entirely overlooked and neglected.

We shall now consider the general etiology of phthisis, since we have included the influence of heredity, under the various aspects, in which the Tubercle Bacillus may gain an entrance into the system.

Etiology of Phthisis Pulmonalis:-

It is absolutely necessary to state a few of the leading facts regarding the Etiology of this disease, if we wish to combat with this "destroying angel," so as to avoid its being handed down to Generations yet unborn, in its present protean aspects, and tendency to a fatal result.

That deficient and impure air, is an important factor in the causation of Phthisis Pulmonalis, cannot be better illustrated, than by reference to the subjoined tables, drawn out by that very able observer Dr. Ogle, in the Supplement to the 45th annual Report of the Registrar-General.

It will be seen at a glance the baneful effects resulting from overheated, and badly-ventilated factories and workshops.

Occupations in which particles of sand, dust, &c are inhaled, are par excellence, those which account for the majority of the cases.

In such instances, the physical characters of the particles inhaled are of importance, in the Etiology, according as they are fine and non-irritating, or angular and metallic.

Although the Factory and Public Health Acts have minimized to some extent the evil results arising from such occupations, still much remains to be done in the way of educating the operatives to see for themselves the risks they run, of illness, and premature death, as it is no uncommon occurrence for them to abandon all those devices and appliances, which have for their object, the prevention of such particles being inhaled.

Comparative Mortality of Men working in Air of different degrees of Purity from Phthisis, and Respiratory Diseases:-

Air.	Occupation.	Phthisis.	Resp. Dis.	Total.
Pure.	Fishermen.	55.	45.	100.
	Farmers.	52.	50.	102.
	Gardeners.	61.	56.	114.
	Agricultural Labourers.	62.	78.	140.
Confined.	Grocers.	84.	59.	143.
	Drapers.	152.	65.	214.
Highly vitiated.	Tailors.	144.	94.	238.
	Printers.	233.	84.	314.

Comparative Mortality of males. 25-65 years. in certain dust-Inhaling occupations. from above diseases:-

Occupation.	Phthisis.	Resp. diseases.	Total.
Coal miners.	64	102.	166.
Carpenters & Joiners.	103.	64.	140.
Masons- Bricklayers- Builders.	124.	102.	229.
Bakers.	104.	94	201.
Wool & Worsted workers.	130.	104.	234.
Cotton workers.	134.	134.	274.
Quarrymen.	156.	138.	294.
Cutlers.	184.	194.	384.
Filemakers.	219.	144.	396.
Earthenware workers.	239.	326.	565.
Cornish miners.	349.	231.	580.
Fishermen.	55.	45.	100.
All males- England & Wales.	220	182.	340.

As illustrative of the prevalence of acute pure Phthisis associated with filthy surroundings, dirt, overcrowding. and bad ventilation, it is sufficient to refer to the acute-rate which formerly existed in barracks, prisons &c, but which in the present day, owing to improved sanitary conditions, is now almost completely conspicuous by its absence.

It has already been pointed out that anything which lowers the normal vitality of the system, predisposes it to the disease, and under this head may be included the following:-

1. Scanty and improper food.
2. Bad hygienic surroundings.
3. Bad ventilation.
4. Pregnancy.
5. Over-lactation.
6. Dampness of the soil and dwelling.
7. Bad plumbing.
8. Diseases which have been shown to be phthisiogenic in nature:
   - α. Syphilis.
   - β. Diabetes.
   - γ. Measles.
   - δ. Whooping Cough.
   - ε. Influenza.

The following may give rise to Phthisis:-

1. Asthma and Emphysema.
2. Syphilis of lung.
3. Cancer of lung.
4. Bronchiectasis.
5. Engorgement of Bronchial glands.
6. Hydatid cysts.
7. Pneumothorax.

(Remainder &c.)

With reference to Climate. it is more common in Temperate, than in very hot, or very cold climates:- and in low and damp situations, rather than in high and dry.

It is also very prevalent in the slums, and densely populated parts of all large towns, especially where there are back-to-back houses. this we know is the favourite abode of other communicable diseases.

Sex- it has been shown to be 12% greater amongst females.

Age and Heredity, have been already fully considered.

We shall now proceed in the last place, to offer a few suggestions, as to the best measures to be taken, so as to prevent the spread of this disease.

Measures suggested in order to prevent the spread of the disease:-

Recognizing its infectious nature, and that it depends essentially upon a specific virus, it should be included under the Infectious Disease (Notification) Act, in this way, having every case reported to the sanitary Authorities.

The Removal to specially-built institutions, such as Cottage Homes, or Hospitals, of those who are unable to be attended to in their homes, under similar conditions as exist in the case of the other Zymotic diseases.

The periodical fumigation and disinfection of the dwelling, clothing, and bedding of the patient.

The disinfection of all discharges from the body, and their reception into vessels containing liquid germicidal preparations.

The burning of all articles which have been exposed to the infection, when of little monetary value.

When death occurs, to have the body quickly interred, and the dwelling thoroughly cleaned out.

Preventing others using the same apartment as the patient especially for sleeping accomodation.

With regard to old insanitary buildings, badly lighted and ventilated, placed back to back, and with little or no modern conveniences, these should be demolished, and replaced by model dwellings, whilst Open spaces should be kept here and there, planted with shrubs and trees, which will act as lungs to the already over-taxed air of the towns.

By framing by-laws such as exist in Glasgow, under the Glasgow Police (Amendment) Act 1890, for enter-

ing Byres &c, for the inspection of cows, to determine if they suffer from any disease which might render the used of the said milk dangerous or injurious to health. It is also enacted that no dairymen &c shall retain any cow suffering from Tuberculosis or such other disease, when he has been informed to that effect under a penalty of £5, and of £10 for selling the milk from such animals.

Power is also given to inspect, examine, seize, condemn and destroy, any carcass, meat, poultry, game &c, if diseased, unsound, or unfit for human consumption.

By strictly enforcing the Dairies, Cow Sheds, and Milk shops order, with special reference to lighting cleansing, ventilation, and cubic capacity of the same, as these are well known to be kept in a very unsatisfactory state.

As Tuberculosis occurs rapidly in the udders of cows, particular attention should be paid to these.

By a system of Quarantine upon animals coming from an infected locality.

By including Tuberculosis under the Contagious Diseases (Animals) Act.

The City of Chicago in its Municipal Code has a bye-law to the effect that no person shall bring into the city or keep therein for sale, or otherwise either for food, or any other purpose, or purposes whatever, any animal, dead or alive, matter, substance, or thing, which shall be, or which may or shall be dangerous or detrimental to Health.

Boiling the milk of suspected animals, as this destroys the virulence of the bacilli.

Total condemnation of all animals suffering from Tuberculosis, as unfit for consumption, as well as of the carcases, no matter however locally, the disease may appear.

Abolition of Burial's Slaughter houses, and the Government supervision and regulation of Public Abattoirs.

Inspection of all dressed meat.

By licensing shops in which animal flesh is sold, and enforcing strict cleanliness upon those engaged in milk and dead-meat trades.

In order to prevent overcrowding which is as we have seen an important feature in the predisposition to Phthisis, it would be well, if some such a that known as the Scotch Lighting system were adopted by Sanitary Authorities in order to cope with this evil. This system consists in affixing to the door of the house, a tin-plate, upon which is written the cubic capacity of the dwelling, and the maximum number of animals allowed to be housed therein. In Glasgow the standard is fixed at 400 cubic feet per adult, or for two children under 10 years of age. Similar regulations exist in Greenock, Edinburgh, and Aberdeen.

It has been ably pointed out by Dr Farr that where the population is dense, there we have increased mortality and morbidity, more especially from Filth diseases, with a lowering of the mean age at death.

Prohibition of the erection of Back-to-Back Houses.

Proper Sewerage and Drainage, so that the Subsoil may be kept dry, and free from dampness, which spreads along the foundations, and walls of dwellings, as a marked decrease in the number of deaths

from Phthisis Pulmonalis has taken place in those towns of Leicester, where these improvements have been carried out.
By more effectual dealings with the smoke nuisance, and abatement of the same.
Finally by educating the people as to habits of cleanliness, sobriety, and in the memorable words of St. Paul, "moderation in all things."
Before concluding, a few words may be said indicative of those measures which should be carried out in the matter of Prophylaxis, in those who have a history of Family Phthisis.

Healthy Residence.
Dry climate.
Bracing air.
Open air exercise, and occupation.
Warm clothing.
Avoidance of all excesses and overstudy
Plenty of sunlight
Large and airy bedroom.
Regular and Nutritious diet.
"Early to bed, and early to rise."
Strongly advising tuberculous mothers against nursing their offspring.

With reference to the production of Immunity or Protective Inoculation, it is as yet too premature to say anything definite about this method, with a view to its demonstration, and lessening the propagation of the disease, Phthisis Pulmonalis.

(over)

Resumé :-

Before closing, let me refer as shortly as possible to the various data and facts, which go to prove the correctness of the dissertation, with which we have been engaged, that Phthisis Pulmonalis is an Infectious disease.

(a) That it is a specific disease, caused by a specific, particulate and living virus - the Tubercle Bacillus -

1. Particulate - because it can be filtered out of the blood:
2. Living - because it has the power of independent self-multiplication within the blood:
3. Specific - because it always reproduces the same disease.

(b) That the bacillus is capable of existing outside the living body for several months. That the chief media through which the disease is transmitted are -

1. Air -
2. Food -
3. Milk.

(c) That the proof of its being Infectious has been distinctly demonstrated.

(d) That it is Contagious, as has been shown, from the cases already referred to, such as by wearing the clothes of deceased victims and through the medium of Bedding, Furniture &c on which the virus has settled, is I think, also beyond doubt.

(e) That Insanitary conditions tend to the propagation of the disease.

And now my task is finished. If I have been successful in showing that Phthisis Pulmonalis is an Infectious disease, my object shall have been accomplished, and I shall be amply rewarded in knowing that "my labour has not been in vain", by having my name inscribed upon the illustrious roll of Graduates of Glasgow University.

Finis.